What's your E2IQ?

ENERGY LEARN

FACT SHEET

Nuclear Energy

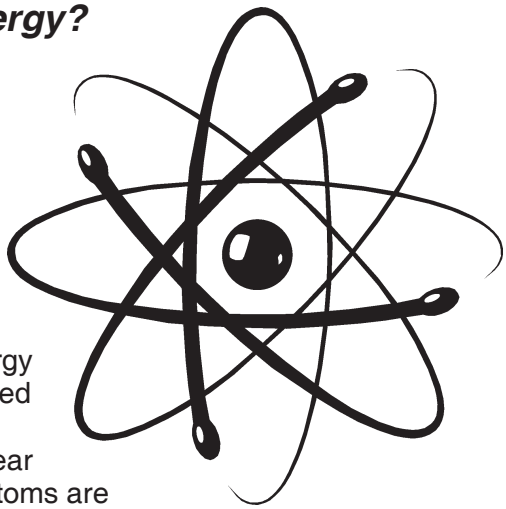
Key Terms

- Ceramic Pellets
- Chain Reaction
- Cooling Tower
- Core
- Fuel Assembly
- Generator
- Neutron
- Nucleus
- Nuclear Energy
- Nuclear Fission
- Nuclear Fusion
- Proton
- Radioactive
- Reactor
- Spent Fuel
- Turbine
- Uranium

Nuclear Energy Facts

- South Carolina become the first state in the South to use nuclear energy for electrical generation when the H.B. Robinson Plant became operational in 1970.
- Nuclear energy provides 9 percent of the electricity generated in the United States. In France, nuclear energy is responsible for about 70 percent of that country's electricity.

What is nuclear energy?



Nuclear energy is energy in the *nucleus* (core) of an atom. Atoms are tiny particles that make up every object in the universe. There is enormous energy in the bonds that hold atoms together.

Nuclear energy can be used to make electricity. But first, the energy must be released. It can be released from atoms in two ways: *nuclear fusion* and *nuclear fission*. In nuclear fusion, energy is released when atoms are combined or fused together to form a larger atom. This is how the sun produces energy. In nuclear fission, atoms are split apart to form smaller atoms, releasing energy. Nuclear power plants use nuclear fission to produce electricity. During nuclear fission, a small particle called a *neutron* hits the *uranium* atom and it splits, releasing a great amount of energy as heat and radiation. Neutrons also are released. These neutrons go on to bombard other uranium atoms, and the process repeats itself over and over again. This is called a *chain reaction.*

The History of Nuclear Energy

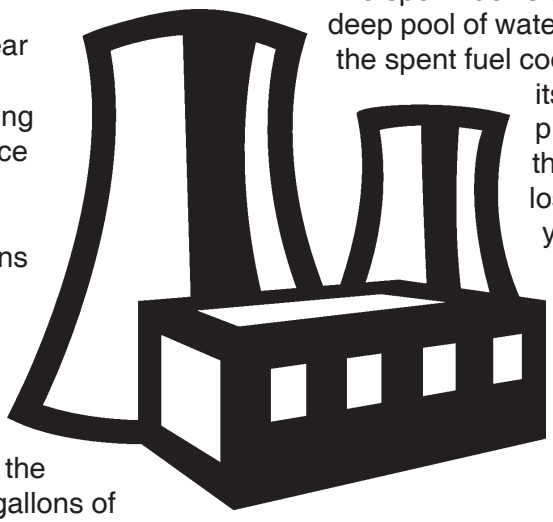
Compared to other energy sources, nuclear energy is a new way to produce energy. It wasn't until the early 1930s that scientists discovered that the nucleus of an atom is made up of particles called *protons* and *neutrons.* A few years later, scientists discovered that the nucleus of an atom could be split by bombarding it with a neutron - the process we call fission. Soon they realized that enormous amounts of energy could be produced by nuclear fission.

Under the dark cloud of World War II, nuclear fission was first used to make a bomb. After the war, nuclear fission was used to generate electricity. Today, it provides 9 percent of the electricity used in the United States.

Continued on back

How does a nuclear power plant work?

Most power plants burn fuel to produce electricity, but not nuclear power plants. Instead, nuclear plants use the heat given off during fission as fuel. Fission takes place inside the *reactor* of a nuclear power plant. At the center of the reactor is the *core,* which contains the uranium fuel.



The uranium fuel is formed into *ceramic pellets.* The pellets are about the size of your fingertip, but each one produces the same amount of energy as 120 gallons of oil. These energy-rich pellets are stacked end-to-end in 12-foot metal fuel rods. A bundle of fuel rods is called a *fuel assembly.*

Fission generates heat in the reactor just as coal generates heat in a boiler. The heat is used to boil water into steam. The steam turns huge *turbine* blades. As they turn, they drive *generators* that make electricity. Afterward, the steam is changed back into water and cooled in a separate structure at the power plant called a *cooling tower.* The water can be used again and again.

Nuclear Waste

Every few years, the fuel rods must be replaced. Fuel that has been removed from the reactor is called *spent fuel*. Nuclear power plants do not produce a large quantity of waste, but the waste is highly *radioactive*.

The spent fuel is usually stored near the reactor in a deep pool of water called the spent fuel pool. Here, the spent fuel cools down and begins to lose most of its radioactivity through a natural process called radioactive decay. In three months, the spent fuel will have lost 50 percent of its radiation; in a year, it will have lost about 80 percent; and in 10 years, it will have lost 90 percent. Nevertheless, because some radioactivity remains for as long as 1,000 years, the waste must be carefully isolated from people and the environment.

Nuclear Energy and the Environment

Nuclear plants produce no air pollution or carbon dioxide, because no fuel is burned. Using nuclear energy may be one way to solve air pollution problems.

The major problem with nuclear power is storage of the radioactive waste. Many people also worry that an accident at a power plant could cause widespread damage.

People are using more and more electricity. Some experts predict we will have to use nuclear energy to produce the amount of electricity people need at a cost they can afford. Whether or not we should use nuclear energy is a decision our society will have to make.

SOUTH CAROLINA Energy Office
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Printed on RECYCLED Paper 09/03